CLAIMS

1. A rotary liquefied natural gas boil-off compressor having at least two compression stages in series, a gas passage passing through the series of compression stages, the gas passage extending through and being in heat exchange relationship with at least one cooling means between the or each pair of compression stages, characterised in that the cooling means or at least one of the cooling means is a cryogenic cooling means and in that there is valve means for controlling flow of cryogenic coolant into the cryogenic cooling means in response to the inlet temperature, or a related parameter, of the next compression stage downstream of the cryogenic cooling means so as, in use, to maintain said inlet temperature at a chosen sub-ambient temperature or between chosen sub-ambient temperature limits.

2. A compressor according to claim 1, characterised in that the cryogenic cooling means comprises an indirect cooling means.

3. A compressor according to claim 1, characterised in that the cryogenic cooling means comprises a direct cooling means.

4. A compressor according to claim 3, characterised in that the direct cooling means comprises a chamber having an inlet for the introduction of a cryogenic liquid.

5. A compressor according to claim 4, characterised in that the outlet of the direct cooling communicates with a vessel adapted to disengage particles of liquid from the natural gas, the vessel having an outlet for natural gas communicating with said next compression stage.

6. A compressor according to any one of the preceding claims, characterised in that there is a cryogenic cooling means intermediate each pair of successive compression stages.

7. A compressor according to any one of the preceding claims, characterised in that there are at least three compression stages in sequence and in that there is at least one direct cryogenic cooling means and at least one indirect cryogenic cooling means.

8. A compressor according to claim 7, characterised in that an inlet of a direct cooling means communicates with an outlet of an indirect cooling means.

9. A compressor according to any one of the preceding claims, characterised in that there is a cryogenic cooling means downstream of the final compression stage.

10. A compressor according to any one of the preceding claims, characterised in that there is a cryogenic cooling means upstream of the first compression stage.

11. A compressor according to any one of the preceding claims, characterised in that the compressor has an intermediate inlet communicating with a forced liquefied natural gas vaporiser.

12. A liquefied natural gas storage tank having an outlet for boiled-off natural gas communicating with a compressor as claimed in any one of the preceding claims, the said cryogenic cooling means communicating with the liquefied natural gas in the storage tank.

13. A method of operating a rotary liquefied natural gas boil-off compressor having at least two compression stages in series and a gas passage

passing through the series of compression stages, the method comprising cooling the compressed boiled-off natural gas by means of a cryogenic coolant downstream of one of the compression stages and upstream of another, monitoring the inlet temperature, or a related parameter, of the compressed natural gas at the inlet to the other compression stage, and adjusting the flow rate of cryogenic coolant so as to maintain said inlet temperature at a chosen sub-ambient temperature or between chosen sub-ambient temperature limits.

14. A method according to claim 13, characterised in that the inlet temperature of each compression stage is maintained at a temperature in the range of minus 50 to minus 140°C.

15. A method according to claim 14, characterised in that the pressure ratio across each compression stage is in the range 2.15 : 1 to 3 : 1.

16. A method according to claim 15, characterised in that the pressure ratio across each compression stage is in the range 2.5 : 1 to 3 : 1.